Diabetes Prevention and Control: A Public Health Imperative

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Dara Murphy, MPH, and staff of the Division of Diabetes Translation
National Center for Chronic Disease Prevention and Health Promotion
Centers for Disease Control and Prevention

The Burden of Diabetes Among Americans Continues to Grow

Type 2 diabetes, which affects 17 million Americans and their families,[1] often causes severe complications that can ultimately damage every organ in the body and lead to premature death. These complications include heart disease, blindness, lower extremity arterial disease, kidney failure, dental disease, and increased susceptibility to infections. In many states, half of all people with diabetes do not receive recommended preventive care services that are known to reduce the risk of diabetes complications.[2] The direct economic cost of diabetes in the United States is estimated to be about $100 billion per year.[3] This figure does not take into account the indirect economic costs attributable to potential work time lost to diabetes-related illness or premature death.

The prevalence of diagnosed type 2 diabetes increased sixfold in the latter half of the last century.[4] Diabetes risk factors such as obesity and physical inactivity have played a major role in the dramatic increase in rates of type 2 diabetes in recent years. Age, race, and ethnicity are also important risk factors. The prevalence of diabetes increases with age in all racial and ethnic groups. Whereas 8.6% of Americans over age 20 have diabetes, 20.1% of Americans over age 65 have diabetes. Far fewer Americans younger than age 20 have diabetes, but the prevalence of diabetes in this age group appears to be rising considerably. The rising prevalence of diabetes in this age group, as in other age groups, is attributed to increases in physical inactivity and obesity.

American Indians, black Americans, Latino Americans, and some Asian Americans and Pacific Islanders are disproportionately affected by diabetes.[1] For example, black and Hispanic Americans are almost twice as likely to have diabetes as non-Hispanic white Americans of similar age, and American Indians are almost three times as likely to have diabetes as non-Hispanic whites of similar age. As the prevalence of obesity and sedentary lifestyles increases and the U.S. population becomes older and more ethnically diverse, the prevalence of diabetes is expected to continue to rise.[5]

Socioeconomic and environmental factors may also play a role in a person's risk of developing diabetes and in the course of diabetes once it has developed.[5] People with type 2 diabetes are more likely to have less education and lower incomes than people without diabetes.[6] Elderly minority women, who are more likely to live alone and to have lower socioeconomic status, are also more likely to have diabetes and to lack resources to adequately manage their disease.[7]

Progress to Date

The last two decades have provided great advances in clinical care for people with diabetes. For example, in 1981, photocoagulation treatment was proven effective in preventing diabetes-related blindness.[8] Twelve years later, the results of the landmark Diabetes Control and Complications Trial (DCCT) established that intensive control of blood sugar greatly reduced microvascular complications among people with diabetes.[9] In 2002, findings from the Diabetes Prevention Program (DPP) demonstrated

that lifestyle changes and medications can help prevent diabetes in people with impaired glucose tolerance.[10]

Although diabetes cannot be "cured," these findings prove that the devastation of diabetes can be dramatically reduced. However, for many reasons, large segments of the population have not benefited from these findings. Without broader public health interventions and additional resources, the prevalence of diabetes is expected to continue to increase. This chapter discusses a model for public health action to improve the lives of people, communities, and populations affected by diabetes. This model is based on existing and emerging science and public health experience.

Population-Based Objectives for Diabetes Control and Prevention

Two national sources for population-based objectives for diabetes control and prevention are discussed in this section: *Healthy People 2010,* which lays out the nation's health promotion and disease prevention agenda for the decade, and the National Diabetes Prevention and Control Program, a cooperative effort between CDC and 50 state health departments and 9 jurisdictional health departments. Both sets of objectives are intended to guide state and national planning and coordination efforts.

Healthy People 2010 Objectives

Healthy People 2010 is the third version of the *Healthy People* series published by the Department of Health and Human Services in which it lays out 10-year health objectives for the nation. This document serves as a blueprint for identifying reasonable, science-based goals that can be modified as desired by state and federal agencies, local entities, and communities. *Healthy People 2010* includes 467 objectives in 28 focus areas.

In recognition of the significance of the burden of diabetes and its impact on multiple systems within the body, the nation's *Healthy People 2010* objectives include several related to diabetes.[11] Most of these involve secondary prevention (preventing complications of diabetes) or tertiary prevention (preventing the progression of complications). A few involve primary prevention (preventing diabetes itself).

Chapter 5, which focuses on diabetes, contains 17 objectives directly related to diabetes prevention and control. Many other chapters contain diabetes-related objectives. Table 1 lists the objectives from chapter 5. This list of objectives is matched to five goals that are essential to increasing the length and improving the quality of life for people with diabetes and to preventing diabetes among people at risk.

National Objectives of the National Diabetes Prevention and Control Program

In 1999, the National Diabetes Prevention and Control Program (NDPCP) established multi-year objectives that supported achieving specific *Healthy People 2000* objectives and subsequently *Healthy People 2010* objectives. Developed in collaboration with state partners and accounting for current science, existing state health department capacity, and resource constraints, NDPCP objectives are intended to guide federally funded program and evaluation efforts (see Table 2). Population-level improvements in preventive health care practices that delay or prevent diabetes complications are the major focus of state efforts supported by the national program. Objectives addressing the prevention of diabetes itself are expected in 2003–2004.

Prevention Opportunities

There is a strong scientific basis for the primary, secondary, and tertiary prevention of diabetes. However, translating the science into effective interventions to lessen the burden of diabetes requires considerable resources and effort.

Levels of Prevention

State diabetes programs should address three levels of diabetes prevention: primary, secondary, and tertiary.

Primary prevention interventions seek to delay or halt the development of diabetes. The most

compelling evidence for the effectiveness of primary prevention is for interventions targeting people with impaired glucose tolerance,[10] who are at highest risk of developing diabetes. Both drugs and lifestyle changes have proven effective in helping these people delay or prevent the development of diabetes, although lifestyle changes related to losing weight and increasing physical activity have been most effective.[10] Primary prevention efforts in state diabetes programs cover a wide spectrum. At a minimum, state diabetes programs should partner with other programs that assume responsibility for reducing risk factors in the population at large, such as those that provide broad nutrition and physical activity interventions. (See Chapter 6.) In such partnerships, diabetes programs play a supportive

Table 1. *Healthy People 2010* Objectives Directly Related to Diabetes Prevention and Control

	***Healthy People 2010* Objectives Related to Goals for Diabetes Prevention and Control**	**Prevent risk factors for type 2**	**Detect & treat glucose intoler-ance**	**Detect diabetes**	**Control glucose in people with diabetes**	**Prevent compli-cations**	**Detect & treat diabetes compli-cations**
5-1	People with diabetes receive diabetes education	x			x	x	x
5-2	Prevent new cases diabetes	x					
5-3	Reduce rate diagnosed diabetes	x	x				
5-4	Increase rate diagnosed diabetes among people with diabetes			x			
5-5	Reduce diabetes death rate	x	x	x	x		x
5-6	Reduce diabetes-related deaths in people with diabetes				x	x	x
5-7	Reduce deaths from cardiovascular disease in people with diabetes				x	x	x
5-8	Reduce proportion pregnant women with gestational diabetes	x					
5-9	Reduce frequency foot ulcers in people with diabetes			x	x	x	x
5-10	Reduce proportion lower extremity amputations in people with diabetes			x	x	x	x
5-11	Increase proportion people with diabetes getting annual microalbumin					x	x
5-12	Increase proportion adults with diabetes getting at least annual A1c				x	x	x
5-13	Increase proportion adults with diabetes getting annual eye exam					x	x
5-14	Increase proportion adults with diabetes getting annual foot exam					x	x
5-15	Increase proportion adults with diabetes getting annual dental exam					x	x
5-16	Increase proportion people with diabetes taking aspirin at least 15x/month					x	
5-17	Increase proportion people with diabetes self-monitoring glucose				x	x	

rather than a leadership role. For example, diabetes programs could participate in coalitions that seek broad environmental changes to support walking. These coalitions would typically be developed, sponsored, and led by state nutrition and physical activity programs. On the other hand, diabetes programs should play a leadership role in primary prevention interventions focused on ensuring that people at highest risk for diabetes have access to interventions that will delay or avert the development of the disease. The leadership role may entail aggressively soliciting partnerships with cardiovascular health, nutrition, and physical activity programs to develop lifestyle change interventions.

Secondary and tertiary prevention interventions focus on people with diabetes and seek to prevent (secondary) or control (tertiary) the devastating complications of this disease. More proven intervention models are available for both secondary and tertiary prevention than for primary prevention. For example, maintaining near normal glucose, blood pressure, and cholesterol levels has been shown repeatedly to reduce diabetes complications.[10, 12] Additionally, routine preventive care practices such as foot exams, eye exams, and frequent A1C testing are well-established components of quality diabetes care.[13] To ensure that these benefits reach the people who need them, ideal programs develop, implement, and coordinate multilevel interventions targeting people with diabetes, their families, their health care systems, and their communities.

All three types of prevention interventions rely on active stakeholder involvement and support. Stakeholders include people with diabetes, voluntary organizations that have an interest in diabetes or serve populations disproportionately affected by diabetes, health care providers (e.g., primary care providers, endocrinologists, diabetes educators, eye care specialists), and academic institutions. However, program planners are encouraged to explore partnerships with organizations (e.g. urban planning groups, restaurant associations) that may not traditionally work with the diabetes community but can assist in implementing interventions.

Achieving population-level impact in the primary, secondary, and tertiary prevention of diabetes is a complex task that requires resources, competent leadership, and a diverse staffing mix at the national, state, and provider levels. State diabetes programs should collaborate with a wide variety of partners to ensure an appropriate balance between efforts to prevent diabetes complications and efforts to prevent the onset of diabetes. The ability to capitalize on

Table 2. National Diabetes Control Program Objectives

1. By 2008, demonstrate success in achieving an increase in the percentage of people with diabetes in your jurisdiction who receive the recommended foot exams.
2. By 2008, demonstrate success in achieving an increase in the percentage of people with diabetes in your jurisdiction who receive the recommended eye exams.
3. By 2008, demonstrate success in achieving an increase in the percentage of people with diabetes in your jurisdiction who receive the recommended vaccinations.
4. By 2008, demonstrate success in achieving an increase in the percentage of people with diabetes in your jurisdiction who receive the recommended A1C tests.
5. By 2008, demonstrate success in reducing health disparities for high-risk populations with respect to diabetes prevention and control.
6. By 2008, demonstrate success in linking to programs for promotion of wellness and physical activity, weight and blood pressure control, and smoking cessation for people with diabetes.

Source: CDC, Division of Diabetes Translation, 2002

prevention opportunities requires a strong infrastructure to plan and support interventions, nurture partnerships, and monitor and evaluate progress.

Types of Strategies

State diabetes programs should pursue three major types of strategies: health systems change, community intervention, and health communications. These three strategies should be implemented at multiple levels and in tandem with each other.

Health Systems Change

The U.S. Task Force for Community Preventive Services strongly recommends disease and case management to improve diabetes clinical outcomes.[14] State programs should not only seek to improve preventive health care practices by providers and people with diabetes, but also seek to redesign health care processes related to diabetes care.

Strategies to improve health care systems and access to quality care can address either the primary, secondary, or tertiary prevention of diabetes. Such strategies addressing primary prevention might aim to identify more people with impaired glucose tolerance by increasing screening among populations at high risk, including obese people, people over age 45, and members of certain racial or ethnic groups. Health system change strategies addressing secondary and tertiary prevention might demonstrate the benefit of policy interventions that support self-management of diabetes (e.g., adding lay health workers to the staff of some medical practices, using information technology to communicate with people with diabetes outside of the provider's office,[15] expanding support for patients with diabetes as the source of control of diabetes care[16]).

Community Intervention

Community intervention strategies can combine aspects of primary, secondary, and tertiary prevention. Community intervention strategies aimed at the primary prevention of diabetes might include community-based exercise and healthy nutrition programs targeting people at high risk for diabetes. Community intervention strategies aimed at secondary and tertiary prevention might seek to increase the availability of influenza vaccinations or to provide diabetes education for people with diabetes in gathering places for adults.[14] Initiatives can also mobilize community members to improve access to care for people with diabetes, such as by establishing community diabetes support groups or by holding routine diabetes question-and-answer sessions at local pharmacies.[14] Other community intervention strategies might address broader issues that affect individuals with diabetes and their families and communities, such as the need for social support and stress reduction. For example, efforts could include advocacy for increasing the availability of diabetes education programs outside of normal working hours so that entire families are able to participate together.

Health Communications

Diabetes health communications interventions are based on consumer research and often involve raising awareness of diabetes and its complications by disseminating health information to targeted audiences. Health communications should be viewed as a complementary strategy tied to health systems change or community interventions. Health communications strategies are rarely effective as stand-alone activities.

Diabetes health communications strategies are appropriate for primary, secondary, and tertiary interventions. Possible primary prevention interventions include awareness campaigns targeting people with impaired glucose tolerance, as well as their health care providers and their employers. Secondary interventions include developing and disseminating targeted messages to address misconceptions about flu and pneumococcal immunizations. Tertiary interventions include developing and disseminating targeted messages to increase rates of foot examinations for special populations.

CDCynergy, a CDC-developed CD-ROM to help organizations plan health communications activities,[17] suggests that the development of health communications initiatives should include the following steps:

- Defining and describing the problem.
- Analyzing the problem.
- Identifying and profiling audiences.
- Developing a communication strategy and tactics.
- Developing an evaluation plan.
- Launching the initiative and gathering feedback from participants.

Program planners are encouraged to review the experience of programs in other states or communities. However, these programs should be viewed as guides and not templates, since interventions usually need to be tailored to a particular population.

Basic State Infrastructure for Diabetes Control

Several components are necessary to ensure a complete state-based public health program in diabetes. The impact of state programs is maximized when all of these components have been put into action.

Surveillance and Evaluation

A complete state public health program must have information available to 1) define the nature and extent of the diabetes burden (surveillance), 2) focus intervention efforts, and 3) determine if interventions are having an impact (evaluation).

Surveillance

In June 2000, the Council for State and Territorial Epidemiologists published a list of indicators for diabetes surveillance (Table 3). These indicators cover a wide range of issues important for monitoring diabetes trends and for planning and evaluating diabetes program efforts. Other important indicators to follow include levels of physical activity and obesity, diabetes education, and self-monitoring of blood glucose. State programs should also monitor environmental changes that affect the course of diabetes, including state and federal health policy changes. In general, surveillance data are critical for monitoring state and national progress, including progress toward meeting *Healthy People 2010* objectives.

The following are the best-developed and most widely used sources of diabetes-specific state surveillance data:

Table 3. Diabetes Surveillance Indicators

1. Mortality from or with diabetes mellitus.
2. Mortality from or with diabetic ketoacidosis.
3. Diabetes mellitus prevalence.
4. Influenza vaccinations among adults with diabetes mellitus.
5. Pneumococcal vaccinations among adults with diabetes mellitus.
6. Foot exams among people with diabetes mellitus.
7. Dilated eye exam among people with diabetes mellitus.
8. Hospitalizations among people with diabetes mellitus.
9. Amputations of lower extremities attributable to diabetes mellitus.

Source: *Indicators for Chronic Disease Surveillance: Data Volume,* Council for State and Territorial Epidemiologists, 2000.

Behavioral Risk Factor Surveillance System (BRFSS), including the diabetes module. BRFSS is a state-based, random-digit-dialed telephone survey designed to yield representative population samples for each state. Each state should administer the BRFSS annually (including the special diabetes module) to monitor the extent of and trends in the diabetes burden, behavioral risk factors, and preventive care practices.

Hospital discharge data. These data are available in most states, sometimes for a fee, and are important for monitoring diabetes-related illness. However, hospital discharge data should be viewed as complementary to BRFSS and other data rather than as a sole source of information.

State vital records data. Data from death certificates and birth certificates are used for monitoring diabetes-related death rates and pregnancy outcomes. However, only about 40% of people who die with diabetes have diabetes listed on their death certificate. As a result, death certificate data cannot be used to monitor death rates, causes of death, and relative risk for death among people with diabetes unless the death certificate has been modified to collect data on decedents' diabetes status. The new standard birth certificate scheduled to be implemented in 2003 will collect data on whether the mother had either preexisting or gestational diabetes (diabetes diagnosed during pregnancy). This new information will help to determine the effects of diabetes on pregnancy and trends in diabetes-related birth defects.

Partnering health organizations such as provider groups, managed care organizations, and community health centers can be important sources of diabetes surveillance data. States are encouraged to supplement existing data with specialized surveillance efforts, such as special surveys of minority and other populations not adequately represented in available data sources.

Evaluation

Diabetes programs need to conduct evaluations to determine how effective their activities are in producing desired short-term and long-term effects. Logic modeling is a recommended tool for this purpose, and NDPCP has developed an evaluation framework based on the CDC model (Figure 1).[18] Because diabetes and its complications can take many years to develop and diabetes mortality data tend to be inaccurate, programs need to use intermediate measures of success as part of their evaluations.[19] Good process evaluation is also essential to understanding why a program is or is not achieving results and to know how to adjust the program accordingly.[20] Ultimately, however, the success of a program is determined by its long-term success in reducing diabetes incidence, illness, complications, and deaths. Evaluation of progress toward more intermediate objectives should always be conducted with those long-term objectives in mind.

State Plans

The development of a strategic plan is critical to the success of state and local diabetes programs. Stakeholders should be actively involved in developing, reviewing, and evaluating the plan. Once developed, plans should be reviewed and updated as progress is made or circumstances change. Ideally, the plan's goals and objectives should be tailored to national, state, and local needs, and strategies for achieving these goals and objectives should be based on proven and evaluated experiences whenever possible.

The diabetes objectives in *Healthy People 2010* (Chapter 5)[21] provide a template for national, state, and local efforts to prevent and control diabetes. The National Diabetes Prevention and Control Program objectives (Table 2) also provide a reference point for prevention and control efforts. Although state plans can include objectives and activities that are not covered by either of these national blueprints, such efforts sacrifice opportunities for creating synergy

between national, state, and local programs and for efficiently using resources.

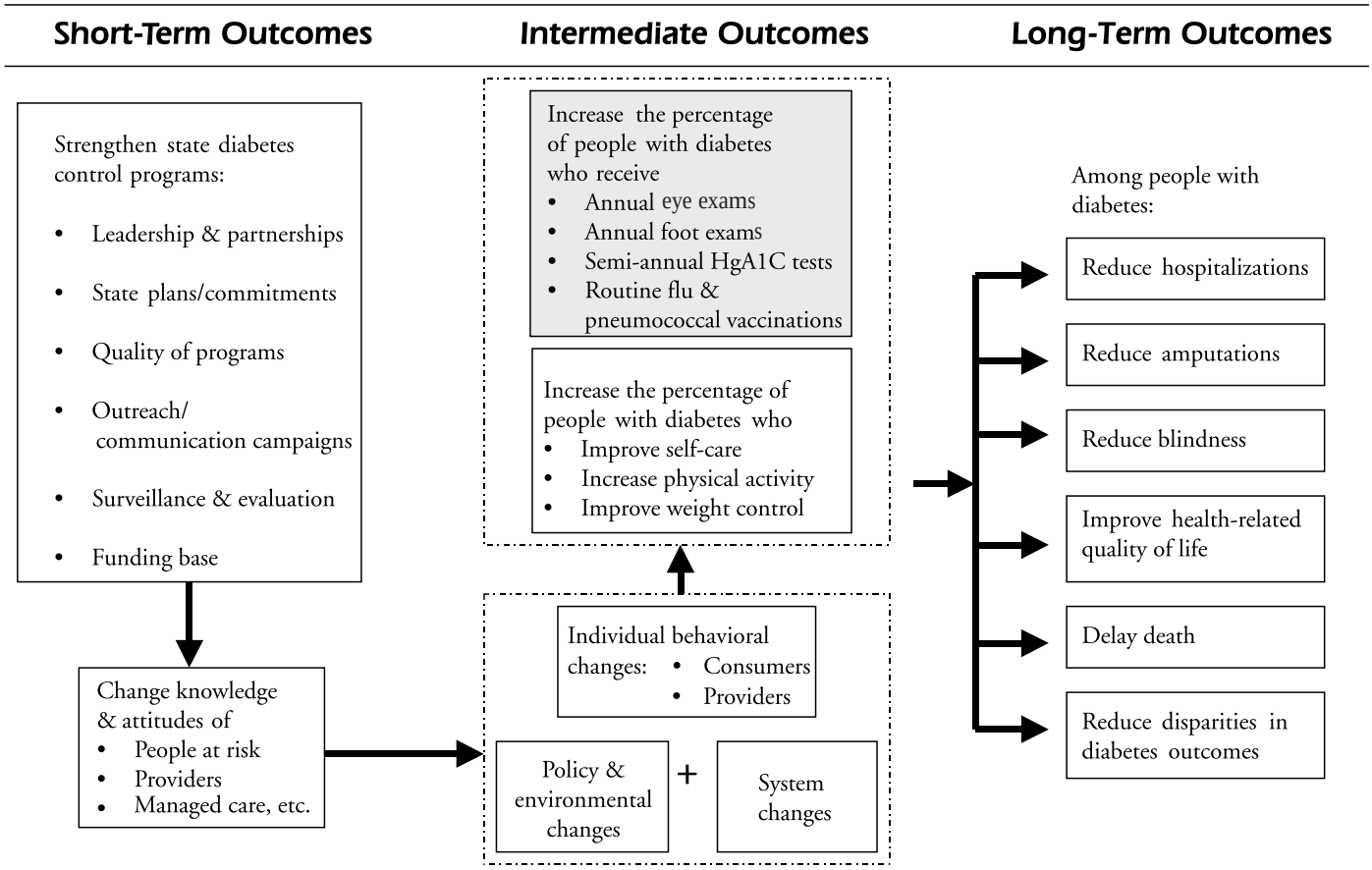
Plans should address the primary, secondary, and tertiary prevention of diabetes and should describe the roles and responsibilities of the various partners. At a minimum, these roles should be described as supportive or leadership. For state programs, this distinction is especially useful in primary prevention activities, because leadership for some interventions to reduce obesity in the general population is more suitable for other public programs.

Partnerships

State diabetes programs should collaborate with partners to facilitate and coordinate various efforts to prevent and control diabetes. Programs can bring together partners through special initiatives, topical meetings, and issue-specific planning. Partners can include professional organizations, voluntary diabetes organizations, community health centers, employers and other health care purchasers, community organizations, businesses, schools, and faith-based organizations.

If possible, state diabetes programs should also establish an advisory board consisting of representatives of partnership groups and other key members of the diabetes community. The activities and membership of these boards should be strategically planned to strengthen and help guide program efforts. Population-level changes invariably require action by particular groups. Therefore, engaging these groups in strategy and planning is key to selecting appropriate and effective interventions and securing commitments of resources. In addition,

Figure 1. Diabetes Prevention and Control Program



advisory boards can help coordinate state diabetes control efforts with similar efforts of other private- and public-sector partners across the state.

Policy

Another important role of state diabetes programs is to help private organizations and federal, state, and local agencies design policies that optimize the health of people with and at risk for diabetes. Most commonly, these programs provide guidance about a population's need for diabetes care services and resources. They also should provide information, on request, to state legislators and governors as they develop regulations concerning insurance benefits for people with diabetes (e.g., for diabetes supplies and self-management education) or expanded coverage for people at risk for diabetes (e.g., for nutrition counseling for people with impaired glucose tolerance). By tracking changes in laws and regulations over the years, monitoring their health impact, and offering technical assistance to public- and private-sector policy makers, state diabetes programs can substantially influence the development of new policies. To be effective in this role, however, state programs must be able to provide accurate assessments of science and public health initiatives related to diabetes.

The role of diabetes programs in policy change efforts varies from case to case. When the policy in question relates exclusivly to diabetes, diabetes programs should take the lead. However, when the policy in question involves broader public health concerns, including diabetes, it may be more appropriate for the program to play a supporting role in larger partnership efforts.

Examples of policy initiatives include those that

- Promote work environments conducive to healthy eating and exercise for people with or at risk for diabetes.
- Provide more support and flexibility for people with diabetes to administer insulin injections or monitor blood glucose levels at school or at work.
- Increase the accessibility of safe places to exercise (e.g., expanded availability of community school resources for physical activity).

Staffing

The most critical staffing area for state diabetes programs is program leadership, which typically consists of the program director and program coordinator. The director is responsible for guiding, planning, and monitoring public health programs. The person filling this senior-level position should have access to senior policy makers and have a working knowledge of state health department programs. The coordinator reports to the director and is responsible for day-to-day program operations.

Other key staff members include an epidemiologist and program evaluator. The epidemiologist is responsible for developing and maintaining a comprehensive surveillance system to monitor diabetes incidence and related trends in risk factors and program effects. The program evaluator ensures that program interventions are regularly evaluated and provides continuous feedback on the impact of interventions to program staff. In small programs, the same staff member may have more than one of these responsibilities. In larger programs, several staff members may be assigned to each of these areas. Additionally, one or more staff members should be responsible for developing and maintaining partnerships.

Staff should have specialized skills in each of the major strategy areas (i.e., health systems change, community interventions, and health communications). Staff responsible for health systems change should have direct experience in managing or working with health systems such as community health centers, state Medicaid programs, and insurance or health benefits programs. These staff members should be familiar with how health care is organized, financed, and delivered in the state. Staff responsible for community interventions should have experience and training in community

outreach and health education. Staff responsible for health communications should have training and experience in using social marketing concepts to develop and deliver health messages.

Programs can access medical expertise through a consultation arrangement. Programs should avoid excessive staffing with diabetes health care providers because these programs do not provide direct care.

Leadership

State Leadership

State programs provide leadership at the state level through advocacy, planning, partnering, and program support. State leadership activities often mirror and complement the federal leadership activities listed below but are limited to the state or locality. However, at other times state roles and activities are distinct and help to inform federal efforts. For example, state-funded pilot demonstrations sometimes influence the selection of future national program objectives. State diabetes programs also can provide leadership to other states through consultation, regional coalition building, and resource sharing.

Federal Leadership

CDC's diabetes division was established in 1977. In 1989, the name of the division was changed to Division of Diabetes Translation (DDT) to reflect the division's mission of translating information from clinical trials into clinical and public health practice. The vision of DDT is to reduce the preventable burden of diabetes in the United States. The division's strategy has these major components:

Define the diabetes burden through public health surveillance: The division continually strives to strengthen public health surveillance systems for diabetes. Working with the states, DDT is primarily using the diabetes-specific module of the Behavioral Risk Factor Surveillance System (BRFSS) to develop a nationwide, state-based surveillance system. The division is also establishing diabetes surveillance systems within managed care organizations. An additional DDT priority is improving the quality, accuracy, and timeliness of surveillance data for racial/ethnic populations and children, the two groups among whom the burden of diabetes is increasing most rapidly.

Conduct applied translational research: The division conducts applied research that focuses on translating research findings into clinical and public health practice. This research identifies the public health implications of results from clinical trials and scientific studies and applies these findings in the health care system. Areas of research include the following:

- Access to quality care for diabetes, especially within managed care organizations.
- Early detection of undiagnosed diabetes.
- Cost-effectiveness of diabetes prevention and control activities.
- Effectiveness of health practices to address risk factors for diabetes.
- Effectiveness of strategies to prevent type 2 diabetes.

Develop state-based diabetes prevention and control programs (DPCPs): CDC provides funding for DPCPs in all 50 states, the District of Columbia, and 8 U.S.-affiliated jurisdictions. The primary goal of these DPCPs is to improve access to affordable, high-quality diabetes care and services, especially for high-risk and disproportionately affected populations. The states funded for capacity-building focus on developing state health department expertise in planning, designing, and coordinating diabetes control activities. Sixteen states receive expanded funding to establish basic implementation programs that enable them to implement statewide, multilevel public health approaches to reduce the burden of diabetes.

CDC has advocated for partnerships between DPCPs and state-level efforts funded by other federal agencies. One well-documented effort has been a collaboration between the Health Resources and Services Administration (HRSA) and their network

of community health centers and state DPCPs. (See Diabetes Program Examples, page 2–13) These linkages have resulted in changes in both CDC's program and HRSA's program. A similar effort between CDC and the Centers for Medicare & Medicaid Services (CMS) to link state-based quality improvement organizations with DPCPs has resulted in several important demonstration projects.

Implement the National Diabetes Education Program (NDEP): The NDEP is a joint initiative sponsored by CDC and the National Institutes of Health. Through a network of more than 200 public and private organizations, the NDEP works to improve diabetes treatment, promote early diagnosis, and prevent the onset of diabetes. Program activities are directed to the general public, people with diabetes and their families, health care providers, payers and purchasers of health care services, and policy makers.

Coordinate media strategies and provide public information: CDC has expanded its capacity to meet a rapidly growing demand for information about diabetes and CDC's diabetes programs. Specific activities include the following:

- National satellite media and marketing training for partners and a national satellite broadcast.
- A national diabetes and flu awareness campaign.
- A public inquiries and publications request system that includes a toll-free telephone line (1-877-CDC-DIAB) that is answered in English and Spanish.
- An Internet site that receives about 1,000 visits a day.

Technical Assistance

Program consultants from CDC are assigned to specific states to provide ongoing guidance in implementing the National Diabetes Program model. These consultants assist each state with training, identifying resources, and solving problems. CDC also provides states with surveillance and epidemiology support on a case-by-case basis. CDC links with national organizations to foster new partnerships, support, and collaboration at the state level through affiliates. Extensive diabetes technical resources, references, and additional information are available on the Web sites listed on page 2–18. These Web sites also include links to other diabetes-related Web pages.

Professional Development and Training

Professional development for staff involved in diabetes prevention and control is essential to program success. Because of the rapid pace of scientific change in the field of diabetes, state programs are encouraged to establish minimal requirements for staff training and development. Staff should receive ongoing training in the latest developments in health systems change strategies, community interventions, health communications, the pathophysiology of diabetes, team building, and diabetes surveillance and evaluation. The following is a list of just some of the organizations that offer multidisciplinary diabetes professional training:

The *American Diabetes Association* sponsors numerous courses for health professionals throughout the year.

Web site: www.diabetes.org/

CDC's *Division of Diabetes Translation* sponsors an annual conference and provides numerous professional development resources.

Web site: www.cdc.gov./diabetes

Wichita State University's Division of Continuing Education, Wichita, KS, offers Diabetes Education Update, a didactic workshop addressing clinical, educational, and psychosocial issues.

Web site: webs.wichita.edu/continuinged/deu_form.htm for course curriculum and registration information.

The *International Diabetes Center, Minneapolis, MN,* offers concise diabetes update courses for health professionals.

Web site: www.parknicollet.com/diabetes/professionals/index.html

The *National Diabetes Education Program (NDEP)* offers electronic professional educational materials through a portion of its Web site.

Web site: www.ndep.nih.gov/

NIH's *National Institute of Diabetes, Digestive, and Kidney Diseases,* offers professional education materials through the NIH Information Clearinghouse.

Web site: www.niddk.nih.gov/

The *American Association of Diabetes Educators* offers certification for diabetes educators and sponsors courses for diabetes educators and health professionals.

Web site: www.aadenet.org/index2.html

Funding

CDC's National Diabetes Control Program provides funding for diabetes control programs in all states, the District of Columbia, and eight U.S. jurisdictions. Program funding ranges from $60,000 to $900,000, within two levels of funding. The average award for the 16 states funded at the basic implementation level in 2002 was $798,313. However, states would, on average, need an estimated 10 times the current level of funding to achieve secondary and tertiary diabetes prevention and control goals.[22] Estimates of the cost of primary prevention activities are not available.

Funding poses a major challenge as state programs strive to achieve the diabetes prevention and control goals of *Healthy People 2010*. CDC requires a state match (1:4 or 1:5) of federal resources. However, because fewer than eight states have been able to meet this match with actual dollars, complementary funds from nongovernmental sources are badly needed. The ability to secure additional funding requires strong advocates, well-evaluated and competently led programs, and a clearly articulated response to the diabetes problem in the state.

Diabetes Program Examples

These examples of state program strategies, collaborations, and methods have been collected from state diabetes programs across the country. These examples represent specific aspects of a single program and are not a description of the state program's total effort. In each example, the type of strategy and contact information are provided.

Diabetes Today

Diabetes Today (DT) is a CDC-sponsored course that is offered around the country and in the Pacific Basin to train public health professionals and members of the community in approaches to mobilizing communities to address diabetes. Using community participation and leadership to identify and address community-level diabetes issues is a goal of this "train the trainer" course, which is offered in English, Spanish, and other languages. The DT course offers tools, processes, and methods for developing community-focused programs that are geographically appropriate and culturally relevant. Additionally, DT training promotes collaboration among community residents, health professionals, and health systems. As a result of DT training, participants from many communities whose residents are at high risk for diabetes have identified the need for more community support groups and diabetes education classes. In Laredo, Texas, for example, the Lado A Lado (Laredoans Against Diabetes and Overweight) community program now offers support groups for adults with diabetes. Several counties in Virginia are working to establish diabetes education programs in accessible settings, such as local schools, hospitals, community health clinics, and churches. A DT program in Guadalupe, Arizona, trains lay health workers ("promotoras") to conduct health promotion programs for people with diabetes and those at high risk of developing diabetes.

Type of Strategy: Community intervention

Contact Information:
Division of Diabetes Translation
National Center for Chronic Disease Prevention and Health Promotion

Centers for Disease Control and Prevention
4770 Buford Highway NE, Mail Stop K-10
Atlanta, GA 30341-3717
Phone: 770-488-5000
Fax: 770-488-5966
Web site: www.diabetestodayntc.org

Project DIRECT

Project DIRECT, a comprehensive, community-based intervention carried out in a predominantly black and low-income community in North Carolina, is sponsored by the state health department and CDC. This project began in 1992 with the formation of a partnership among local community stakeholders, who became key decision makers in all that followed. The project established a multilevel, community-based model that includes diabetes care (providing clinical services), outreach (improving community capacity to identify and treat patients with diabetes), and health promotion (reducing risk factors associated with diabetes through information sharing and environmental and policy changes). This project promotes the primary, secondary, and tertiary prevention of diabetes. Because Project DIRECT is a pioneer program of its type, its leaders now share the challenges they encountered and the lessons they learned with local, state, and national leaders interested in pursuing this community empowerment approach to diabetes prevention and control elsewhere.[23]

Type of Strategy: Community intervention

Contact Information:
Diabetes Control Program Director
NC Department of Health and Human Services
Diabetes Prevention and Control Unit
1915 Mail Service Center
Raleigh, North Carolina 27699-1915
Phone: 919-715-3131
Fax: 919-733-0488

New York Centers of Excellence

The New York Diabetes Program collaborates with 14 regional community coalitions and 3 university-based Centers of Excellence (State University of New York/Upstate Medical University in Syracuse, Mount Sinai Medical Center/East Harlem in New York City, and Columbia–Presbyterian Hospital/Naomi Berrie in New York City) to improve diabetes care. The Centers of Excellence work with peer review organizations, health centers, hospitals, and community organizations to develop educational initiatives and promote collaboration among health care providers to improve diabetes services and access to care. The centers also develop methods to overcome socioeconomic, cultural, and language barriers to services. In 2 years, the community- and provider-focused interventions sponsored by the Centers of Excellence have reduced hospitalization rates by 35% and decreased lower-extremity amputation rates by 39%.

Type of Strategy: Health systems change/ partnerships

Contact Information:
Diabetes Control Program Coordinator
Bureau of Chronic Disease Services
New York State Department of Health
Empire State Plaza Tower, Room 780
Albany, New York 12237-0678
Phone: 518-474-1222
Fax: 518-473-0642

Improving Diabetes Care through Empowerment, Active Collaboration, and Leadership (Project IDEAL)

Project IDEAL is an initiative developed by the Minnesota Diabetes Control Program and Health Partners, a large managed care organization. IDEAL is a systematic, population-based intervention that facilitates diabetes care improvements by identifying the need for changes within primary care clinics and then making these changes happen. During the pilot stage of IDEAL, the frequency of eye exams, foot exams, and microalbumin testing increased

substantially, and these results were replicated in the intervention phase. In 2 years, participants' average A1C values decreased from 9.2% at baseline to 7.7%. Other effects of this intervention include a higher priority for diabetes in managed care and the application of the IDEAL methodology to address asthma, heart disease, hypertension, and other chronic conditions.

Type of Strategy: Health systems change/ partnerships

Contact Information:
Minnesota Diabetes Control Coordinator
Minnesota Department of Health
P.O. Box 64882
St. Paul, Minnesota 55164-0882
Phone: 651-281-9842
Fax: 651-215-8959

The Diabetes Collaborative

The Diabetes Collaborative is an interagency, public-private partnership aimed at improving the quality of health care for secondary and tertiary diabetes prevention in federally funded community health centers. This partnership involves federal, state, and local entities. National partners include HRSA's Bureau of Primary Health Care, CDC's Division of Diabetes Translation, and the Institute for Health Care Improvement. State and local partners include community health centers and state diabetes programs. To date, 40 state programs are participating formally in the collaborative, along with approximately 300 community health centers. Improvement methods include applying the MacColl Institute for Healthcare Innovation's Chronic Care Model[24] and the Institute of Health Improvement's Quality Improvement Model. [25] Common objectives include measuring patients' A1C levels twice per year, at least 90 days apart, and establishing patient self-management goals. Results of the collaborative's efforts to date include a threefold increase (from 20% to 60%) in the percentage of patients who receive A1C testing at the recommended interval.

Type of Strategy: Health systems change/ partnerships

Contact Information:
Division of Diabetes Translation
National Center for Chronic Disease Prevention and Health Promotion
Centers for Disease Control and Prevention
4770 Buford Highway NE MS K-10
Atlanta, GA 30341-3717
Phone: 770-488-5000
Fax: 770-488-5966
Email address: diabetes@cdc.gov
Web site: www.cdc.gov/diabetes

Wisconsin Collaborative Diabetes Quality Improvement Project

The Wisconsin Diabetes Control Program developed the Collaborative Diabetes Quality Improvement Project in partnership with the University of Wisconsin Department of Preventive Medicine. The objectives of this project are to facilitate standardized baseline data collection and to identify and address gaps between current practice and the Wisconsin Essential Care Guidelines. Twenty organizations and 18 HMOs from across the state reported on six indicators of diabetes care for approximately 25,000 people with diabetes in Wisconsin. The indicators were number of A1C tests performed, percentage of people with poorly controlled A1C levels, number of lipid profile tests performed, percentage of people with lipids controlled, number of dilated eye exams performed, and number of people screened for kidney disease. In 2000, all participating HMOs had improved in the six selected indicators since 1999: the proportion of people receiving lipid profiles increased by 10%, the proportion receiving dilated eye exams increased by 8%, and the proportion receiving one or more A1C tests increased by 2%. In addition, control of A1C improved by 4%, control of lipid levels improved by 16%, and screening for kidney disease increased 13%. Two factors critical to the success of this project were that all of the participants, including participating HMOs, were involved in developing the guidelines, and that

information was shared with all participants, many of whom were market competitors. These factors facilitated better coordination of diabetes care, which helped to improve the clinical indicators listed above.

Type of Strategy: Health systems change/ partnerships

Contact Information:
Diabetes Control Program Coordinator
Wisconsin Department of Health
1 West Wilson Street
Room 218
Madison, Wisconsin 53701-2659
Phone: 608-261-6871
Fax: 608-266-8925

The Michigan Diabetes Outreach Network (DON)

The Michigan DON consists of a series of regional networks designed to facilitate comprehensive diabetes assessment, education, referral, and follow-up care through innovative partnerships. Through the coordinated efforts of health departments, private home-care agencies, hospitals, clinics, physicians, and Native American health agencies, people who have diabetes are identified and provided individualized care. As a result of these efforts, most people enrolled in this system have been referred to and have seen all of the recommended health care providers. Furthermore, many of the participants have improved their self-care practices and are now able to self-manage their diabetes. The effectiveness of the DON model was established in 1991, when a published analysis showed that, in just 5 years, the DON serving the Upper Peninsula had reduced the diabetes-related death rate by 27%, the diabetes-related hospitalization rate by 45%, and the diabetes-related lower-extremity amputation rate by 31%. The DON model is the cornerstone of the Michigan Diabetes Control Program and an integral part of quality diabetes care efforts throughout the state.

Type of Strategy: Health systems change/ partnerships

Contact Information:
Diabetes Control Program Coordinator
Diabetes, Dementia, Kidney Section
Michigan Department of Community Health
P.O. Box 30195
Lansing, Michigan 48909
Phone: 517-335-8445
Fax: 517-335-9461
MDON Web site: www.diabetes-midon.org

Utah Statewide Communication Campaign

The goals of this campaign are to improve awareness of diabetes risk factors and screening methods, especially among groups at high risk, and to improve awareness of the most effective ways to control diabetes. The process for developing the campaign included the following:

- Updating the social marketing plan.
- Gathering and analyzing market research on media habits and appropriate messages for target population groups, including Hispanics, Polynesians, and seniors.
- Developing messages and choosing media channels and vehicles appropriate for the target population with diabetes. Decisions were based on market research and a review of materials previously developed by the Utah Diabetes Control Program (UDCP) and the National Diabetes Education Program (NDEP).
- Testing all messages and materials and distributing them.
- Airing NDEP/UDCP television and radio public service announcements, distributing news releases, and developing news stories.
- Developing other promotional items that list the UDCP Web page address and health resource line toll-free number and sending these materials to community partners to distribute to the public.
- Collaborating with local health departments and other community partners to implement public awareness and education activities in their districts.
- Providing materials and training to help health resource line telephone operators respond proficiently to diabetes-related calls and make appropriate referrals.

- Updating and distributing the *Diabetes Resource Manual* (for professionals) and the *Diabetes Directory* (for consumers).
- Maintaining the program's Web page and adding frequently asked questions and questions for patients to ask their doctor.

Evaluation efforts to date have been limited to process evaluation. Utah will conduct an overall diabetes awareness campaign evaluation as well as the Utahns with Diabetes Follow-Up Survey. This communications campaign is only one component of Utah's Diabetes Control Program. Together, the health communications, health systems, and community interventions should help reduce the burden of diabetes in the state.

Type of Strategy: Health communications

Contact Information:
Diabetes Control Program Coordinator
Utah Department of Health
Chronic Disease Control
Division of Community and Family Health Services
288 North 1460 West
P.O. Box 142107
Salt Lake City, Utah 84114-2107
Phone: 801-538-6141
Fax: 801-538-9495
Web site: www.health.utah.gov/diabetes

West Virginia Statewide Diabetes Media Campaign

The West Virginia Diabetes Program implemented a media campaign from September 1999 through July 2002 to improve the preventive health care practices of Medicare beneficiaries with diabetes. The campaign featured rotating messages about A1C testing, eye examinations, influenza immunizations, and other diabetes prevention and diabetes care topics. Evaluation of this effort focused on determining whether Medicare beneficiaries with diabetes saw or heard mass media messages about diabetes and whether hearing messages was associated with a self-reported response. The telephone survey was of a random sample of 1,500 beneficiaries in the West Virginia Diabetes Database from two groups of counties: those with high and those with low exposure to the media campaign as determined from broadcast logs and station coverage maps. The survey asked whether the beneficiary had heard and responded to messages on specified topics.

Beneficiaries who had had high exposure to the messages were about 1.2 times more likely to recall hearing messages on A1C, foot examinations, and influenza immunizations than were beneficiaries with low exposure, and this difference was statistically significant ($p<0.05$). Furthermore, for all four message topics, having heard the messages was significantly associated with the likelihood of self-reported action (e.g., talking to a doctor about A1C testing).

Type of Strategy: Health communications

Contact Information:
Peggy Adams, RNC, MSN, CDE
Diabetes Control Program
Department of Health and Human Resources
350 Capitol St., Room 319
Charleston, West Virginia 25301
Phone: 304-558-0644
Fax: 304-558-1553

Challenges Ahead

Diabetes is an enormous public health problem. However, by continuing to learn more about diabetes and by doing all that is possible to prevent and control this disease, Americans may ultimately succeed in reducing the great burden it creates. Although a greater proportion of public health resources will likely be devoted to primary prevention in the years to come, secondary and tertiary prevention will remain important public health opportunities for reducing the incidence and severity of diabetes complications among people who already have the disease. Moreover, while exercise and physical activity can reduce people's risk for type 2 diabetes, particularly among those with elevated fasting glucose levels and impaired glucose tolerance, translating this knowledge into effective public health actions will not be easy. To provide tangible

evidence of the impact of specific interventions, public health diabetes programs must have a strong evaluation component, and to establish priorities in accordance with scientific evidence, they must be able to respond rapidly to lessons learned.

Technical Resources

The following Web sites provide valuable technical resources for state and local diabetes control programs.

Federal

Centers for Disease Control and Prevention.
www.cdc.gov/diabetes. Provides diabetes statistics, programs, and publications information.

CDC link to Web sites of state diabetes control programs.
www.cdc.gov/diabetes/states/index.htm.

National Diabetes Education Program (NDEP).
www.ndep.nih.gov. Provides information on diabetes resources and tools and on NDEP campaigns.

National Institutes of Health.
www.niddk.nih.gov. Provides information on diabetes research and clinical trial.

U.S. Department of Health and Human Services (HHS) Office of Minority Health.
www.omhrc.gov. Provides information on HHS efforts to address racial and ethnic health disparities.

Healthy People 2010.
www.health.gov/healthypeople/about. Provides information about *Healthy People 2010*. See chapter 5 for information on diabetes.

Health Resources and Services Administration.
www.hrsa.gov. Provides information on programs, resources, and funding.

Nongovernmental Organizations

American Association of Diabetes Educators.
www.aadenet.org.

American Diabetes Association.
www.diabetes.org.

Juvenile Diabetes Research Foundation. International. www.jdrf.org.

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